DATA SHEET

CISCO CATALYST 4500 SERIES SUPERVISOR ENGINE IV

Supervisor Engine for Enterprise LAN Access, Layer 3 Distribution, and Medium-Sized Branch-Office

The Cisco® Catalyst® 4500 Series integrates resiliency for advanced control of converged networks (Figure 1).

Figure 1. Cisco Catalyst 4500 Series Supervisor Engine IV

OVERVIEW

The Cisco Catalyst 4500 Series Supervisor Engine IV integrates nonblocking Layer 2–4 switching with integrated resiliency, further enhancing control of converged networks. Converged data, voice, and video networks with high availability enable business resiliency for enterprise and metropolitan (metro) Ethernet customers deploying Internet-based business applications. The Cisco Catalyst 4500 Series extends control from the backbone to the network edge with intelligent network services, including sophisticated quality of service (QoS), predictable performance, advanced security, comprehensive management, and integrated resiliency with the Supervisor Engine IV. The modular architecture, media flexibility, and expandability of the Cisco Catalyst 4500 Series enable an extended window of deployment in converged networks. This reduces the total cost of ownership by minimizing recurring operational expenses, thus improving return on investment (ROI).

The Cisco Catalyst 4500 Series Supervisor Engine IV delivers next-generation switching technology with proven Cisco IOS® Software to power scalable, intelligent multilayer switching solutions for converged data, voice, and video networks. Optimized for the enterprise LAN access, branch-office backbones, or Layer 3 distribution points, the Cisco Catalyst 4500 Series Supervisor Engine IV provides the performance and scalability to handle the network applications of today and the future. Compatible with the Cisco Catalyst 4500 Series chassis and line cards, this supervisor engine helps ensure an extended window of deployment to further strengthen the scalability of the modular Cisco Catalyst 4500 Series (Table 1).

All contents are Copyright © 1992–2004 Cisco Systems, Inc. All rights reserved. Important Notices and Privacy Statement.

Table 1. Comparison Between Supervisor Engine IV, V, and V-10GE

Feature or Description	Supervisor Engine IV	Supervisor Engine V	Supervisor Engine V-10GE
Layer 2–4 performance	48 Mpps; 64 Gbps	72 Mpps; 96 Gbps	102 Mpps; 136 Gbps
Chassis support	Cisco Catalyst 4006, Catalyst 4503, Catalyst 4506, and Catalyst 4507R	Cisco Catalyst 4006, Catalyst 4503, Catalyst 4506, Catalyst 4507R, and Catalyst 4510R	Cisco Catalyst 4503, Catalyst 4506, Catalyst 4507R, and Catalyst 4510R
Redundant capable	Yes (Cisco Catalyst 4507R only)	Yes (Cisco Catalyst 4507R and Catalyst 4510R only)	Yes (Cisco Catalyst 4507R and Catalyst 4510R only)
Active Gigabit Ethernet uplinks in redundant mode	2	4	4
Active 10-Gigabit Ethernet uplinks in redundant mode	0	0	2
Switching capacity	64 Gbps	96 Gbps	136 Gbps
Throughput	48 Mpps	72 Mpps	102 Mpps
Multilayer switching	Full Layer 2–4 services and routing	Full Layer 2–4 services and routing	Full Layer 2–4 services and routing
Interior Gateway Routing Protocol (IGRP), Enhanced IGRP (EIGRP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), and Intermediate System-to-Intermediate System (IS-IS)	Yes	Yes	Yes
Dynamic Buffer Limiting (DBL): Congestion-avoidance feature	Yes	Yes	Yes
QoS sharing	Support only on nonblocking Gigabit Ethernet ports	Supported on all ports	Supported on all ports
Broadcast suppression	Software*	Hardware**	Hardware**
Multicast suppression	No	Yes	Yes
802.1Q-in-802.1Q (QinQ)	Pass-through	In hardware	In hardware
Active redundant supervisor-engine uplinks	2	4	Two 10-Gigabit Ethernet uplinks or four 1- Gigabit Ethernet uplinks

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

Feature or Description	Supervisor Engine IV	Supervisor Engine V	Supervisor Engine V-10GE
NetFlow support	Yes	Yes	Yes (integrated)
Minimum software requirement	Cisco IOS 12.1(12c)EW or later	Cisco IOS 12.2(18)EW or later	Cisco IOS 12.2(25)EW or later
CPU	333 MHz	400 MHz	800 MHz
Synchronous dynamic RAM (SDRAM)	512 MB	512 MB	512 MB
Active VLANs	4,000	4,000	4,000
Multicast entries	28,000 (Layer 3); 16,000 (Layer 2)	28,000 (Layer 3); 16,000 (Layer 2)	128,000
Spanning Tree Protocol STP instance	3,000	3,000	3,000
Switching virtual interfaces (SVIs)	4,000	4,000	4,000
NVRAM	Yes (512 KB)	Yes (512 KB)	Yes (512 KB)
Internet Group Management Protocol (IGMP) snooping	Yes (16,000)	Yes (16,000)	Yes (16,000)

* Hardware performance for nonblocking Gigabit Ethernet ports, and software performance for all other ports

** Hardware performance for all ports

The Supervisor Engine IV can be deployed in single-chassis nonredundant mode in the Cisco Catalyst 4006, Catalyst 4503, Catalyst 4506, and Catalyst 4507R. It also can be deployed in single-chassis redundant mode as an option in the Cisco Catalyst 4507R chassis (slots 1 and 2 only). (Refer to Table 2.)

Table 2. Cisco Catalyst 4500 Series Supervisor Engine IV Performance per Chassis

	Cisco Catalyst 4503 Chassis	Cisco Catalyst 4506 Chassis	Cisco Catalyst 4507R Chassis	Cisco Catalyst 4510R Chassis
Supervisor Engine IV (part number WS-X4515)	Supported 28 Gbps, 21 Mpps	Supported 64 Gbps, 48 Mpps	Supported 64 Gbps, 48 Mpps	Not supported

SUPERVISOR ENGINE IV REDUNDANCY FOR BUSINESS RESILIENCY

The Cisco Catalyst 4507R chassis using the Supervisor Engine IV has been designed with an optional 1 + 1 redundant supervisor capability for integrated resiliency. One Supervisor Engine IV is designated as the primary (active) supervisor and is responsible for normal system operation. The other (secondary) can serve as a standby, monitoring the operation of the primary supervisor.

With the support of stateful switchover (SSO), information is synchronized between supervisors to allow the standby supervisor to immediately take over in subsecond time when the primary is nonoperational. Layer 2 links are maintained transparently without the need of renegotiating sessions. As a result, business-critical applications such as voice-over-IP (VoIP) calls are not dropped. Nonstop forwarding (NSF) awareness is also supported,

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

providing the ability to interface with NSF-capable devices and to continue forwarding packets as routing information is updated upon a supervisor-engine switchover.

The Supervisor Engine IV redundancy scheme is similar to that of the Supervisor Engine V. Alerts are generated to the network-monitoring software if either supervisor fails, and hot-swapping of supervisors is supported without disrupting system operation. Switchover of supervisors can be forced by software, or by the user with the Simple Network Management Protocol (SNMP). The resiliency features of the Cisco Catalyst 4500 Series prevent network outages that could result in lost business and revenue.

PREDICTABLE PERFORMANCE AND SCALABILITY

The Cisco Catalyst 4500 Supervisor Engine IV delivers a 64 Gbps switching fabric with a 48-Mpps forwarding rate in hardware for Layer 2–4 traffic. Switching performance is independent of the number of route entries or Layer 3 and 4 services enabled. Hardware-based Cisco Express Forwarding routing architecture allows for increased scalability and performance.

The Cisco Catalyst 4500 Series is optimized for multimedia applications with its advanced multicast support. Protocol Independent Multicast (PIM), Source-Specific Multicast (SSM), and Pragmatic General Multicast (PGM) are supported to provide end users with additional scalability to support multimedia applications. The Supervisor Engine IV also supports IGMP snooping in hardware, enhancing performance and reducing network traffic by allowing a switch to dynamically add and remove hosts from a multicast group.

INTEGRATED CISCO IOS SOFTWARE SWITCHING SOLUTION

The Cisco Catalyst 4500 Series Supervisor Engine IV supports Cisco IOS Software, providing operational ease of use by allowing customers to deploy a single network operating system across their routed and switched infrastructures. Industry-leading Cisco IOS Software integrates features for scalability, bandwidth management, security services, network resiliency, and manageability into the Cisco Catalyst 4500 Series. Cisco IOS Software provides investment protection and tight coupling of Layer 2–4 services into a single, unified configuration file and system image. The Cisco Catalyst 4500 Series Supervisor Engine IV defaults to Layer 2 switching upon startup and can be configured to perform Layer 3 and 4 switching and routing services as desired.

INTELLIGENT NETWORK SERVICES WITH QoS AND SOPHISTICATED TRAFFIC MANAGEMENT

The Cisco Catalyst 4500 Series Supervisor Engine IV offers superior per-port QoS features to help ensure that network traffic is classified, prioritized, and scheduled optimally to efficiently handle bandwidth-hungry multimedia, time-sensitive (voice), and mission-critical applications. The Supervisor Engine IV can classify, police, and mark incoming packets, allowing the administrator to differentiate between traffic flows and enforce policies based on granular QoS fields. Sharing, shaping, and strict priority configurations determine scheduling of egress traffic. Beginning in Cisco IOS Software Release 12.1(13)EW, the Supervisor Engine IV supports DBL, a congestion-avoidance feature.

For details about the QoS features (including DBL), refer to the QoS on Cisco Catalyst 4500 Series Cisco IOS Software-Based Supervisor Engines document at:

http://www.cisco.com/en/US/partner/products/hw/switches/ps4324/prod_white_papers_list.html.

COMPREHENSIVE MANAGEMENT

The Cisco Catalyst 4500 Series Supervisor Engine IV features a single console port and a single IP address to manage all system features. Remote in-band management is available with SNMP, Telnet client, BOOTP, and Trivial File Transfer Protocol (TFTP). Support for local or remote out-of-band management is delivered through a terminal or modem attached to the console interface.

The Cisco Catalyst 4500 Supervisor Engine IV delivers a comprehensive set of management tools to provide the required visibility and control in the network. Managed with CiscoWorks solutions, Cisco Catalyst switches can be configured and managed to deliver end-to-end device, VLAN, traffic,

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

and policy management. The CiscoWorks LAN Management Solution (LMS) bundle offers tools such as CiscoWorks Resource Manager Essentials and CiscoView. These Web-based management tools offer several services, including automated inventory collection, software deployment, easy tracking of network changes, views into device availability, and quick isolation of error conditions.

ADVANCED SECURITY

The Cisco Catalyst 4500 Series offers a rich set of industry-leading, integrated security features to proactively lock down your critical network infrastructure. It reduces security risks with 802.1x-based user authentication, authorization, and accounting (AAA). The security policy enforcement is uncompromised with the wire-rate, dedicated access control lists (ACLs) to fend off ever-increasing virus and security attacks. The Cisco Catalyst 4500 Series offers powerful, easy-to-use tools to effectively prevent the untraceable man-in-the-middle attacks, IP spoofing, and flooding attacks, without any change to the end-user or host configurations. Secure remote access and network management is accomplished with the Secure Shell (SSH versions 1 and 2) Protocol and SNMPv3.

FEATURES AT A GLANCE

Layer 2 Features

- Layer 2 hardware forwarding at 48 Mpps
- Layer 2 switch ports and VLAN trunks
- IEEE 802.1Q VLAN encapsulation
- Inter-Switch Link (ISL) VLAN encapsulation (excluding blocking ports on WS-X4418-GB)
- Dynamic Trunking Protocol (DTP)
- VLAN Trunking Protocol (VTP) and VTP domains
- Support for 4096 VLANs per switch
- Per-VLAN Spanning Tree Protocol (PVST+) and Per-VLAN Rapid Spanning-Tree Protocol (PVRST)
- Spanning-tree PortFast and PortFast guard
- Spanning-tree UplinkFast and BackboneFast
- 802.1s
- 802.1w
- 802.3ad
- Spanning-tree root guard
- Cisco Discovery Protocol
- IGMP snooping v1, v2, and v3
- Cisco EtherChannel®, Cisco Fast EtherChannel, and Cisco Gigabit EtherChannel technology across line cards
- Port Aggregation Protocol (PAgP)
  - Link Aggregation Protocol (LACP)
- Unidirectional link detection (UDLD) and aggressive UDLD
- QinQ pass-through
- Jumbo frames (up to 9216 bytes)

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

- Baby giants (up to 1600 bytes)
- Unidirectional Ethernet
  - SSO in subsecond failover time

Layer 3 Features

- Hardware-based IP Cisco Express Forwarding routing at 48 Mpps
- IP routing protocols: IGRP, EIGRP, OSPF, Routing Information Protocol (RIP), and RIP2)
- BGP4 and Multicast Border Gateway Protocol (MBGP)
- Hot Standby Router Protocol (HSRP)
- NSF Aware
- Software routing of Internetwork Packet Exchange (IPX) and AppleTalk
- IS-IS routing protocol
- IGMP v1, v2, and v3
- IGMP filtering on access and trunk ports
- IP Multicast routing protocols (PIM, SSM, and Distance Vector Multicast Routing Protocol [DVMRP])
- PGM
- Cisco Group Multicast Protocol (GMP) server
- Full Internet Control Message Protocol (ICMP) support
- ICMP Router Discovery Protocol
- Policy-based routing (PBR)
- Virtual Route Forwarding-lite (VRF-lite)
- IPv6 software switched

Sophisticated QoS and Traffic Management

- Per-port QoS configuration
- Support for four queues per port in hardware
- Strict priority queuing
- IP differentiated services code point (DSCP) and IP Precedence
- Classification and marking based on IP type of service (ToS) or DSCP
- Classification and marking based on full Layer 3 and Layer 4 headers
- Input and output policing based on Layer 3 and Layer 4 headers
- Support for 1024 policers on ingress and 1024 policers on egress configured as aggregate or individual
- Shaping and sharing output queue management
- DBL: Congestion-avoidance feature
- No performance penalty for granular QoS functions

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

- Auto-QoS command-line interface (CLI) for VoIP deployments

Predictable Performance

- 64 Gbps switching fabric
- Layer 2 hardware forwarding at 48 Mpps
- Layer 3 hardware-based IP Cisco Express Forwarding routing at 48 Mpps
- Layer 4 TCP and User Datagram Protocol (UDP) hardware-based filtering at 48 Mpps
- No performance penalty with advanced Layer 3 and Layer 4 services enabled
- Software-based learning at a sustained rate of 1000 hosts per second
- Support for 32,768 MAC addresses
- Support for 131,072 entries in routing table (shared between unicast and multicast)
- Scalability to 4000 virtual ports (VLAN port instances)
- Bandwidth aggregation up to 16 Gbps through Cisco Gigabit EtherChannel technology
- Hardware-based multicast management
- Hardware-based ACLs

Comprehensive Management

- Cisco Network Assistant
- Single console port and single IP address to manage all system features
- Software configuration management, including local and remote storage
- Optional Compact Flash memory card to store software images for backup and easy software upgrades
- Manageable through CiscoWorks Windows network-management software on a per-port and per-switch basis, providing a common management interface for Cisco routers, switches, and hubs
- SNMP v1, v2, and v3 instrumentation, delivering comprehensive in-band management
- CLI-based management console to provide detailed out-of-band management
- Remote Monitoring (RMON) software agent to support four RMON groups (history, statistics, alarms, and events) for enhanced traffic management, monitoring, and analysis
- Support for all nine RMON groups through the use of a Cisco SwitchProbe® analyzer (Switched Port Analyzer [SPAN]) port, which permits traffic monitoring of a single port, a group of ports, or the entire switch from a single network analyzer or RMON probe
- Analysis support, including ingress port, egress port, and VLAN SPAN
- NetFlow VLAN statistics (Cisco Catalyst 4500 NetFlow Services Card required)
- Remote SPAN (RSPAN)
  - SPAN ACL filtering
  - Dynamic Host Configuration Protocol (DHCP) client autoconfiguration
  - Enhanced SNMP MIB support

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

Advanced Security

- TACACS+ and RADIUS, which enable centralized control of the switch and restrict unauthorized users from altering the configuration
- Standard and extended ACLs on all ports
- 802.1x user authentication (with VLAN assignment and guest VLAN extensions)
- Trusted boundary
- Router ACLs (RACLs) on all ports (no performance penalty)
- VLAN ACLs (VACLs)
- Port ACLs (PACLs)
- Private VLANs (PVLANs) on access and trunk ports
- DHCP snooping and Option 82 insertion
- Port security
- SSHv1 and SSHv2
- VLAN Management Policy Server (VMPS) client
- Unicast MAC filtering
- Unicast port flood blocking
- Dynamic Address Resolution Protocol (ARP) inspection
- IP source guard
- Community private VLAN

CISCO CATALYST 4500 SERIES NETFLOW SERVICES CARD FOR SUPERVISOR ENGINE IV

The Cisco Catalyst 4500 NetFlow Services Card (Figure 2) is an optional daughter card for the Cisco Catalyst 4500 Series Supervisor Engine IV or V, providing Layer 3 and VLAN statistics without affecting the forwarding performance rates on the supervisor engine (Figure 2).

Figure 2. Cisco Catalyst 4500 NetFlow Services Card

NetFlow Services Card Product Description

NetFlow allows customers to monitor traffic flows for the purpose of billing, network planning, or security. The Cisco Catalyst 4500 NetFlow Services Card supports per-packet statistics capture in hardware for flow- and VLAN-based statistics monitoring. NetFlow captures and caches detailed information about each data flow (a stream of packets traveling in one direction from one endpoint to another across the network). Data in the NetFlow cache includes information about specific flows, including the IP address, packet and byte count, time stamp, and application port. Data

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

is then exported, collected, and analyzed for numerous purposes such as virus and denial-of-service (DoS) mitigation, and accounting. More information about NetFlow technology is available at:

http://www.cisco.com/warp/public/cc/pd/iosw/prodlit/iosnf_ds.htm.

NetFlow Services Card Applications

NetFlow technology efficiently provides metering for critical applications, including network traffic accounting, usage-based network billing, network planning, network monitoring, and data-mining capabilities for both service provider and enterprise customers.

Enterprise customers have found NetFlow useful for departmental charge-backs, cost allocation, network budget justification, and network monitoring and planning. Service providers are using NetFlow to charge customers according to bandwidth, application usage, QoS, or distance rather than at a flat rate. NetFlow has proven to be a scalable and efficient means of network accounting, capacity planning, and security.

A more detailed list of general NetFlow applications is available at:

http://www.cisco.com/warp/public/732/Tech/nmp/netflow/netflow_techdocs.shtml.

NetFlow Services Card Features

NetFlow Data Export Version 5 is supported in Cisco IOS Software Release 12.1(13)EW. Cisco IOS Software Release 12.1(19)EW provides several enhancements, including support for NetFlow Version 8, which supports various NetFlow Data Export aggregation schemes. Cisco IOS Software Release 12.1(19)EW also provides additional fields for NetFlow Version 5.

The supported fields within NetFlow Version 5 in Cisco IOS Software Release 12.1(19)EW follow:

- Source and destination IP address (hardware)
- IP Protocol (hardware)
- Layer 4 source and destination ports (for TCP and UDP or 0 otherwise) (hardware)
- Start and end time stamps (hardware)
- Packet counts and byte counts (hardware)
- I/O interface (software)
- Next-hop router (software)
- Source and destination autonomous-system number (software)
- Source and destination prefix mask (software)
- VLAN statistics collection
- CLI support for NetFlow and VLAN statistics
- SNMP support for VLAN statistics
- NetFlow aggregation support (Version 8)

Cisco Catalyst 4500 NetFlow Services Card Hardware and Software Requirements

The Cisco Catalyst 4500 NetFlow Services Card is supported only on the Supervisor Engine IV and V with Cisco IOS Software and is not supported in the Cisco Catalyst Operating System Software.

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

Software Requirements

- The minimum software versions are as follows:
  - Supervisor IV with NetFlow Services Card: Cisco IOS Software Release 12.1(13)EW or later
  - Supervisor V with NetFlow Services Card: Cisco IOS Software Release 12.2(18)EW or later
- NetFlow Collection Engine (NFC) and Cisco Network Data Analyzer (NDA) requirements:
  - Cisco CNS NFC Version 3.5 or higher
  - Cisco NDA Version 3.6 or higher

Hardware Requirements

- Supervisor Engine IV or V is required.
- Redundant Supervisor Engine IV daughter-card configurations must match. If a Cisco Catalyst 4500 NetFlow Services Card is deployed on a primary supervisor engine, then a second NetFlow Services Card must be deployed on a secondary Supervisor IV in the same chassis.

The Cisco Catalyst 4500 NetFlow Services Card can be shipped preinstalled with a Supervisor Engine IV from the factory or as a separate, field-replaceable unit. The Supervisor Engine IV must be removed from the chassis to install the Cisco Catalyst 4500 NetFlow Services Module; it is not hot-swappable.

TECHNICAL SPECIFICATIONS

Management

- CiscoWorks LMS; includes CiscoWorks Resource Manager Essentials
- CiscoView
- SNMP v1, v2, and v3
- RMON I and II
- RFC 1213-MIB (MIB II)
- UDP-MIB
- TCP-MIB
- CISCO-FLASH-MIB
- CISCO-IMAGE-MIB
- RFC 2233 (IF-MIB)
- CISCO-CONFIG-MAN-MIB
- CISCO-MEMORY-POOL
- CISCO-CDP-MIB
- RMON-MIB lite (RFC 1757)
- RMON2-MIB lite (RFC 2021)
- HC-RMON-MIB
- SMON-MIB

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

- ENTITY-MIB (V1-RFC 2037) (V2- RFC 2737)
- CISCO-PROCESS-MIB
- CISCO-CONFIG-COPY-MIB
- CISCO-ENTITY-EXT-MIB
- CISCO-ENTITY-ASSET-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- CISCO-ENTITY-SENSOR-MIB
- CISCO-ENVMON-MIB
- BRIDGE-MIB (RFC 1493)
- CISCO-PAGP-MIB
- CISCO-PRIVATE-VLAN-MIB
- CISCO-STP-EXTENSIONS-MIB
- CISCO-VLAN-MEMBERSHIP-MIB
- CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB
- IGMP-MIB
- PIM-MIB
- OSPF-MIB
- CISCO-ENTITY-VENDORTYPE-OID-MIB
- CISCO-SYSLOG-MIB
- BGP4-MIB
- CISCO-BULK-FILE-MIB
- CISCO-CLASS-BASED-QOS-MIB
- CISCO-FTP-CLIENT-MIB
- CISCO-HSRP-MIB
- CISCO-IGMP-FILTER-MIB
- CISCO-IPMROUTE-MIB
- CISCO-PORT-SECURITY-MIB
- CISCO-RMON-CONFIG-MIB
- CISCO-VTP-MIB
- ETHERLIKE-MIB
- EXPRESSION-MIB
- CISCO-PORT-STORM-CONTROL-MIB

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

Industry Standards

- Ethernet: IEEE 802.3 and 10BASE-T
- Fast Ethernet: IEEE 802.3u, 100BASE-TX, and 100BASE-FX
- Gigabit Ethernet: IEEE 802.3z and 802.3ab
- IEEE 802.3af Power over Ethernet (PoE)
- IEEE 802.1D Spanning Tree Protocol
- IEEE 802.1w rapid reconfiguration of spanning tree
- IEEE 802.1s multiple VLAN instances of spanning tree
- IEEE 802.3ad LACP
- IEEE 802.1p class-of-service (CoS) prioritization
- IEEE 802.1Q VLAN
- IEEE 802.1x user authentication
- 1000BASE-X (gigabit interface converter [GBIC])
- 1000BASE-X (Small Form-Factor Pluggable [SFP])
- 1000BASE-SX
- 1000BASE-LX/LH
- 1000BASE-ZX
- RMON I and II standards

Supported Line Cards and Modules

- WS-F4531—Cisco Catalyst 4500 NetFlow Services Daughter Card
- WS-X4148-FE-LX-MT—Cisco Catalyst 4500 Fast Ethernet Switching Module, 48-port 100BASE-LX10 single-mode fiber (SMF) (MT-RJ)
- WS-X4148-FE-BD-LC—Cisco Catalyst 4500 Fast Ethernet Switching Module, 48-port 100BASE-BX-D SMF (LC)
- WS-X4124-FX-MT—Cisco Catalyst 4000 Fast Ethernet Switching Module, 24-port 100BASE-FX (MT-RJ)
- WS-X4148-FX-MT—Cisco Catalyst 4500 Fast Ethernet Switching Module, 48-port 100BASE-FX multimode fiber (MMF) (MT-RJ)
- WS-X4124-RJ45—Cisco Catalyst 4500 10/100 Module, 24 ports (RJ-45)
- WS-X4148-RJ—Cisco Catalyst 4500 10/100 Module, 48 ports (RJ-45)
- WS-X4148-RJ21—Cisco Catalyst 4500 10/100 Module, 48-port telco (4 x RJ-21)
- WS-X4248-RJ21V—Cisco Catalyst 4500 PoE 802.3af 10/100, 48 ports (RJ-21)
- WS-X4148-RJ45V—Cisco Catalyst 4500 Cisco Prestandard PoE 10/100, 48 ports (RJ-45)
- WS-X4224-RJ45V—Cisco Catalyst 4500 PoE 803.3af 10/100, 24 ports (RJ-45)
- WS-X4248-RJ45V—Cisco Catalyst 4500 PoE 802.3af 10/100, 48 ports (RJ-45)
- WS-X4232-GB-RJ—Cisco Catalyst 4500 32-Port 10/100 (RJ-45), 2-Gigabit Ethernet (GBIC) module
- WS-X4232-RJ-XX—Cisco Catalyst 4500 32-Port 10/100 (RJ-45), plus modular uplink slot

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

- WS-U4504-FX-MT—Cisco Catalyst 4500 Fast Ethernet Uplink Daughter Card for WS-X4232-RJ-XX, 4-port 100BASE-FX (MT-RJ)
- WS-X4302-GB—Cisco Catalyst 4500 Gigabit Ethernet Module, 2 ports (GBIC)
- WS-X4306-GB—Cisco Catalyst 4500 Gigabit Ethernet Module, 6 ports (GBIC)
- WS-X4506-GB-T—Cisco Catalyst 4500 Gigabit Ethernet Module, 6 ports 10/100/1000 802.3af PoE or 1000BASE-X (SFP)
- WS-X4418-GB—Cisco Catalyst 4500 Gigabit Ethernet Module, server switching, 18 ports (GBIC)
- WS-X4448-GB-LX—Cisco Catalyst 4500 48-Port 1000BASE-LX (SFPs included)
- WS-X4448-GB-SFP—Catalyst 4500 Gigabit Ethernet Module, 48 ports 1000BASE-X (optional SFPs)
- WS-X4424-GB-RJ45—Cisco Catalyst 4500 24-Port 10/100/1000 Module (RJ-45)
- WS-X4448-GB-RJ45—Cisco Catalyst 4500 48-Port 10/100/1000 Module (RJ-45)
- WS-X4548-GB-RJ45—Cisco Catalyst 4500 Enhanced 48-Port 10/100/1000 Module (RJ-45)
- WS-X4524-GB-RJ45V—Cisco Catalyst 4500 PoE 802.3af 10/100/1000, 24 ports (RJ-45)
- WS-X4548-GB-RJ45V—Cisco Catalyst 4500 PoE 802.3af 10/100/1000, 48 ports (RJ45)
- WS-G5483—Cisco 1000BASE-T GBIC
- WS-G5484—Cisco 1000BASE-SX Short-Wavelength GBIC (MMF only)
- WS-G5486—Cisco 1000BASE-LX/LH Long-Haul GBIC (SMF or MMF)
- WS-G5487—Cisco 1000BASE-ZX Extended-Reach GBIC (SMF)
- GLC-T—1000BASE-T SFP
- GLC-SC-MM— Gigabit Ethernet SFP, LC connector SX transceiver
- GLC-LH-SM— Gigabit Ethernet SFP, LC connector LX/LH transceiver
- GLC-ZX-SM—1000BASE-ZX SFP
- Cisco Coarse Wavelength-Division Multiplexing (CWDM) GBIC solution
- Cisco CWDM SFP solution

Indicator and Port Specifications

- System status: Green (operational); red (faulty)
- Switch usage load: 1- to 100-percent aggregate switching usage
- Console: RJ-45 female
- Reset (switch recessed protected)
- Uplinks: Link and active
- Image management port: 10/100BASE-TX (RJ-45 female) data terminal equipment (DTE); green (good); orange (disabled); off (not connected)

Software Requirements

The Cisco Catalyst 4500 Series Supervisor Engine IV is supported only in Cisco IOS Software and is not supported in the Cisco Catalyst Operating System Software. The minimum software versions are as follows:

- Supervisor Engine IV, Cisco IOS Software Release 12.1(12c)EW or later

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

- Supervisor Engine IV with the NetFlow daughter card, Cisco IOS Software Release 12.1(13)EW

Environmental Conditions

- Operating temperature: 32 to 104ºF (0 to 40ºC)
- Storage temperature: –40 to 167ºF (–40 to 75ºC)
- Relative humidity: 10 to 90 percent, noncondensing
- Operating altitude: –60 to 2000m

REGULATORY STANDARDS COMPLIANCE

Table 3. Cisco Catalyst Supervisor Engine IV Regulatory Standards Compliance

Specification	Standard
Regulatory Compliance	• CE marking
Safety	• UL 60950 • CAN/CSA-C22.2 No. 60950 • EN 60950 • IEC 60950 • TS 001 • AS/NZS 3260
EMC	• FCC Part 15 (CFR 47) Class A • ICES-003 Class A • EN55022 Class A • CISPR22 Class A • AS/NZS 3548 Class A • VCCI Class A • EN 55022 • EN 55024 • EN 61000-6-1 • EN 50082-1 • EN 61000-3-2 • EN 61000-3-3 • ETS 300 386
Industry EMC, Safety, and Environmental Standards	• GR-63-Core Network Equipment Building Standards (NEBS) Level 3 • GR-1089-Core Level 3 • ETS 300 019 Storage Class 1.1 • ETS 300 019 Transportation Class 2.3 (pending)

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

Specification	Standard
	• ETS 300 019 Stationary Use Class 3.1 • ETS 300 386

ORDERING INFORMATION

Table 4 lists ordering information for the Cisco Catalyst 4500 Series Supervisor Engine IV.

Table 4. Supervisor Engine IV Ordering Information

Product Number	Description
WS-X4515(=)	Cisco Catalyst 4500 Supervisor Engine IV, 2 Gigabit Ethernet, console RJ-45
WS-X4515/2	Cisco Catalyst 4507R Redundant Supervisor Engine IV, 2 Gigabit Ethernet, console RJ-45
WS-F4531(=)	Cisco Catalyst 4500 NetFlow Services Card
S4KL3-12113EW	Cisco IOS Software: Basic Layer 3 software image (RIP, static routes, IPX, AppleTalk)
S4KL3E-12113EW	Cisco IOS Software: Enhanced Layer 3 software image, including OSPF, IGRP, EIGRP, and IS-IS
MEM-C4K-FLD64M	Cisco Catalyst 4500 Cisco IOS® Software-based supervisor, Compact Flash memory, 64-MB option
MEM-C4K-FLD128M	Cisco Catalyst 4500 Cisco IOS® Software-based supervisor, Compact Flash memory, 128-MB option

LICENSING

Use of BGP4 on the Supervisor Engine IV requires a Cisco InterDomain Routing license. Only one Cisco InterDomain Routing license is required per chassis (Table 5).

Table 5. Cisco Catalyst 4500 Series Routing License Ordering Information

Product Number	Description
FR-IRC4(=)	Cisco Catalyst Supervisor Engine IV and V InterDomain Routing feature license (BGP4)

WARRANTY

The warranty for the Supervisor Engine IV is 90 days and it includes hardware replacement with a 10-day turnaround from receipt of a return materials authorization (RMA).

CISCO TECHNICAL SUPPORT SERVICES—EXTENDING NETWORK INTELLIGENCE THAT PROTECTS YOUR NETWORK INVESTMENT. NOW.

Cisco Technical Support Services help ensure that your Cisco products operate efficiently, remain highly available, and benefit from current system software to assist you in effectively managing your network service while controlling operational costs.

Cisco Technical Support Services provide significant benefits that go beyond what is offered under the Cisco warranty policy. Services available under a Cisco SMARTnet® service contract that are not covered under a warranty include the following (Table 6):

- Latest software updates
- Rapid replacement of hardware in next-day, 4-hour, or 2-hour dispatch options

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

- Ongoing technical support through Cisco Technical Assistance Center (TAC)
- Registered access to Cisco.com

Table 6. Technical Support Services Components

Service Feature Overview	Benefit or Advantage
Software Support	This support offers maintenance and minor and major updates for a licensed feature set. Downloading new maintenance releases, patches, or updates of Cisco IOS Software helps enhance and extend the useful life of Cisco devices. Through major software updates, it is possible to extend the life of equipment and maximize application technology investments by: • Adding new functions that, in many cases, requires no additional hardware investment • Increasing the performance of current functions • Enhancing network or application availability, reliability, and stability
Cisco TAC Support	With more than 1000 highly trained customer support engineers, 390 CCIE® experts, and access to 13,000 R&D engineers, Cisco TAC complements your in-house staff with a high level of knowledge in data, voice, and video communications networking technology. Its sophisticated call-routing system quickly routes calls to the correct technology personnel. The Cisco TAC is available 24 hours a day, 365 days a year.
Cisco.com	This award-winning Website provides 24-hour access to an extensive collection of online product and technology information, interactive network management and troubleshooting tools, and knowledge-transfer resources that can help customers reduce costs by increasing staff self-sufficiency and productivity.
Advance Hardware Replacement	Advance Replacement and onsite field engineer options supply fast access to replacement hardware and field resources for installing hardware, minimizing the risk of potential network downtime.

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

Table 7. Technical Support Services—Competitive Differentiators

Feature	Benefit or Advantage
Worldwide Virtual Lab	This extensive lab of Cisco equipment and Cisco IOS Software versions provides an invaluable engineering resource and knowledge base for training, product information, and recreation and testing of selected network issues to help decrease time to resolution.
Cisco TAC Training • Boot camps • Tech calls • Tech forums	Cisco Systems® is committed to providing customers the latest in technology support. These TAC training programs assist customers in case avoidance as well as provide knowledge transfer of Cisco networking expertise.
Cisco Live	A powerful suite of Internet-enabled tools with firewall-friendly features, these secure, encrypted Java applets can turn a simple phone call into an interactive collaboration session, allowing a customer and Cisco TAC support engineer to work together more effectively.
Global Logistics	Award-winning, worldwide hardware replacement support is delivered with 650 depots, covering 120 countries, at a $2.3 billion investment in inventory, taking advantage of 10,000 onsite field engineers.
Cisco IOS Software	This software employs 100 discrete technologies with more than 2000 features. Each year 400 new features are added. Cisco IOS Software is installed in more than 10 million devices and is running on more than 10,000 networks worldwide. It operates on the world's largest IPv6 and VoIP networks and in all major service provider networks worldwide.

FOR MORE INFORMATION

To learn more about how you can take advantage of Cisco Technical Support Services, talk to your Cisco representative or visit Cisco Technical Support Services at:

http://www.cisco.com/en/US/products/svcs/ps3034/ps2827/serv_group_home.html.

For additional information about the Cisco Catalyst 4500, visit:

http://www.cisco.com/go/catalyst4500.

For additional information about Cisco products, contact:

- United States and Canada: 800 553-NETS (6387)
- Europe: 32 2 778 4242
- Australia: 612 9935 4107
- Other: 408 526-7209
- http://www.cisco.com

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com

Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems, Inc.
168 Robinson Road
#28-01 Capital Tower
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

Cisco Systems has more than 200 offices in the following countries and regions. Addresses, phone numbers, and fax numbers are listed on **the Cisco Web site at www.cisco.com/go/offices.**

Argentina • Australia • Austria • Belgium • Brazil • Bulgaria • Canada • Chile • China PRC • Colombia • Costa Rica • Croatia • Cyprus Czech Republic • Denmark • Dubai, UAE • Finland • France • Germany • Greece • Hong Kong SAR • Hungary • India • Indonesia • Ireland Israel • Italy • Japan • Korea • Luxembourg • Malaysia • Mexico • The Netherlands • New Zealand • Norway • Peru • Philippines • Poland Portugal • Puerto Rico • Romania • Russia • Saudi Arabia • Scotland • Singapore • Slovakia • Slovenia • South Africa • Spain • Sweden Switzerland • Taiwan • Thailand • Turkey • Ukraine • United Kingdom • United States • Venezuela • Vietnam • Zimbabwe

Copyright © 2004 Cisco Systems, Inc. All rights reserved. CCIP, CCSP, the Cisco *Powered* Network mark, Cisco Unity, Follow Me Browsing, FormShare, and StackWise are trademarks of Cisco Systems, Inc.; Changing the Way We Work, Live, Play, and Learn, and iQuick Study are service marks of Cisco Systems, Inc.; and Aironet, ASIST, BPX, Catalyst, CCDA, CCDP, CCIE, CCNA, CCNP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, the Cisco IOS logo, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Empowering the Internet Generation, Enterprise/Solver, EtherChannel, EtherSwitch, Fast Step, GigaStack, Internet Quotient, IOS, IP/TV, iQ Expertise, the iQ logo, iQ Net Readiness Scorecard, LightStream, Linksys, MGX, MICA, the Networkers logo, Networking Academy, Network Registrar, *Packet*, PIX, Post-Routing, Pre-Routing, RateMUX, Registrar, ScriptShare, SlideCast, SMARTnet, StrataView Plus, Stratm, SwitchProbe, TeleRouter, The Fastest Way to Increase Your Internet Quotient, TransPath, and VCO are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the United States and certain other countries.

All other trademarks mentioned in this document or Web site are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0402R)

204108.27_ETMG_CC_11.04

Printed in the USA

© 2004 Cisco Systems, Inc. All right reserved.
Important notices, privacy statements, and trademarks of Cisco Systems, Inc. can be found on cisco.com